



ADB Working Paper Series

**QUALITY OF HEALTH CARE IN THE
LAO PEOPLE'S DEMOCRATIC REPUBLIC**

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Abstract

The Lao People's Democratic Republic (Lao PDR) has ambitious and laudable goals for universal health coverage, with a view to increasing health outcomes especially for the most vulnerable in society. It has set up the National Health Insurance Bureau, which covers nearly the entire population, through which out-of-pocket payments have been reduced and access to health care facilities has increased, including utilization. However, the attention given to the quality of care is still less than optimal. Further, while the Lao PDR has existing guidelines and policies for quality, its measurement capacity is still nascent. In particular, work on clinical quality of care is just beginning. This paper outlines the different dimensions of quality (structural, process, outcome), and reports results from data collected from six facilities in Luang Prabang on clinical quality, using vignettes. Findings show that the Lao PDR tends to focus on structural elements of care, such as staffing levels and infrastructure, rather than process measures, which are linked experimentally to better outcomes. Vignettes is a feasible tool to measure quality of care in the Lao PDR, but its methodology needs to be better understood by policy makers. The paper links with current proposed Asian Development Bank projects in the Lao PDR on quality of health care and complementary technical assistance projects.

Keywords: quality of care, Lao People's Democratic Republic, patient outcomes, vignettes

JEL Classification: I10, I15

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1. INTRODUCTION

The Lao People's Democratic Republic (Lao PDR) has recently introduced national health insurance along with new national practice guidelines and standards. With a government commitment to increasing the domestic resources for health, the Lao PDR is in a unique and exciting transition phase to further improve the health and well-being of its people. To date, a large portion of health policy efforts have been directed toward improving access to health services, as part of universal health coverage (UHC). Today, an estimated 90% of the population is reported to be covered by public insurance, and that number is growing.¹ Along with UHC, over the past decade, the Ministry of Health has inspired and created a culture for change and improvement in health care among health care administrators and providers. The first quality management tool, 10 Minimum Requirements (10MR),² released in 2003, instituted the foundational commitment to patient-centered care and data tracking. The recently released 5 Goods and 1 Satisfaction (5G1S)³ builds on the foundation of 10MR and focuses on better diagnosis and treatment to improve patient outcomes. These efforts are foundational but so far fall short of providing specific indicators to help guide and track improvements.

Under the Asian Development Bank Health Sector Governance Program and with the support of the Department of Planning and Cooperation, the team met with Ministry officials, international donors, and health care providers and administrators.⁴ The purpose was to understand opportunities in the Lao PDR's health care system to further improve access and address the quality of care delivered. What we found was high levels of commitment and enthusiasm for improving care but not a robust, overarching framework for clinical quality improvement. While selected resources exist to drive improvements in care, such as the Dok Champa Guidelines⁵ and the Disbursement Linked Indicator 6 quality checklists, we did not find focused resources and tools to improve what is at the crux of good quality of care, which is better care delivery. Limited medical schooling, specialty training, and ongoing continuing medical education opportunities are basic challenges to provider improvement and the delivery of evidence-based care. An even more fundamental challenge is the paucity of data on clinical practice quality. Reform efforts are underway to implement accreditation and training standards for providers,⁶ which could go a long way in ensuring the appropriate level of knowledge for new and graduating medical students. This, however, doesn't address the level of care being provided to patients today. Lack of care measurement and

¹ Lao PDR District Health Information System 2.

² The 10 minimum requirements are these: (1) the hospital is accessible to all patients 24 hours a day; (2) the hospital welcomes all patients with warmth and hospitality; (3) the hospital has all the essential drugs; (4) the hospital diagnoses and treats diseases of four major medical care departments (internal medicine, surgery, obstetrics and gynecology, pediatrics); (5) the hospital does tests of diseases using basic techniques of medical science; (6) the hospital has a patient referral system; (7) the hospital keeps records of all patients daily; (8) the hospital gives routine vaccinations and maintains a good quality cold chain; (9) the hospital promotes safe delivery for all mothers and gives well-baby check-ups to all children; and (10) the hospital monitors and evaluates maternal and child health activities regularly. The Lao PDR Ministry of Health Department of Curative Medicine. Handbook of Minimum Requirements for Service Renovation in District Hospitals. 2008.

³ The items are the following: (1) warm welcome, (2) cleanliness, (3) convenience, (4) accurate diagnosis, (5) good and quick treatment, and satisfaction by the patient. Lao PDR, Policy on the Management of Service Quality, "Five Goods, One Satisfaction," for Health Facilities at Different Levels in Lao PDR, 2016.

⁴ Results of the first mission are found in a draft report: Peabody JW, Tran M, Paculdo D, Sato A, Ramesh, K. Preliminary Quality of Care Assessment of Lao PDR Health Sector.

⁵ Guidelines to implement quality of health care in Lao PDR under the 5 Goods, 1 Satisfaction Policy.

⁶ ADB CDTA. Consultant: Dr. Sophal Oum.

transparency and clear care-performance indicators makes it difficult for policy makers and administrators to implement initiatives that will have an impact on the care provided— and by extension on health outcomes.

To improve outcomes, the essential first step is to have a comprehensive understanding of current care practices with indicators that push providers to better evidence-based care practices. Accordingly, in our second mission,⁷ we sought to obtain data on the quality of care in the Lao PDR directly from doctors to identify the gaps in care, demonstrate the feasibility of data collection using clinical performance and values (CPVs), and learn about the best interventions to elevate provider care and improve patient outcomes nationwide. CPV vignettes are a validated quality measure of a physician's ability to evaluate, diagnose, and treat specific diseases and conditions using a simulated patient approach (Peabody et al. 2000, 2004; Dresselhaus et al. 2004). They have thus been used widely in the US and low- and middle-income settings (Quimbo et al. 2015; Peabody et al. 2015). CPVs are patient cases given in paper format or electronically to a group of providers. They are open-ended and comprehensively assess a provider's clinical practice in five domains: (1) taking a medical history, (2) performing a physical exam, (3) ordering tests, (4) making a diagnosis, and (5) prescribing a treatment plan. Two to three trained physician abstractors blinded to the CPV-taker's identity score each vignette. Because they are case-mix adjusted (all providers care for the same cases), it is possible to determine where diagnostic errors are made and what treatments have been employed, including the costs of those evaluations and treatments. The CPV cases were scored based on standard international clinical guidelines, and scores were calculated by calculating the percent of items correctly answered for each domain and across all five domains (total). CPVs are typically used serially several months apart to continually assess provider improvement and provide feedback and relevant educational resources.

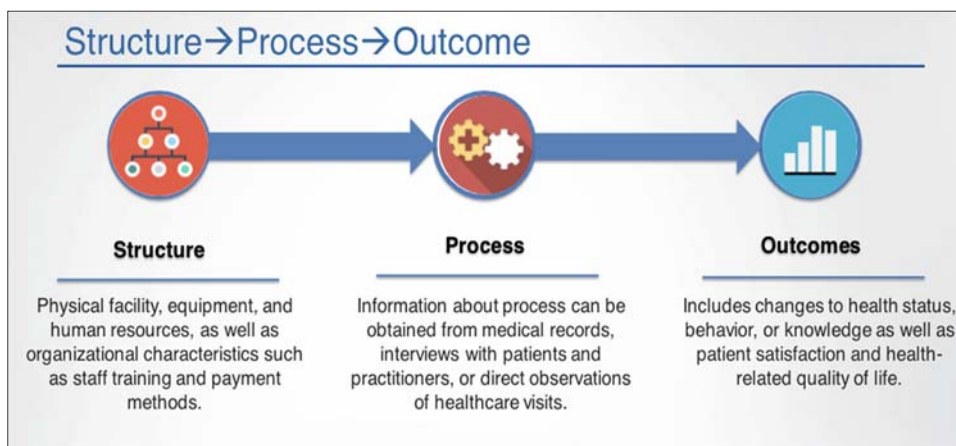
On this mission, we looked specifically at the province of Luang Prabang and provider care for three common and increasingly prevalent conditions affecting the people of the Lao PDR: hypertension, diabetes mellitus, and pediatric diarrhea. Luang Prabang province was purposively selected as the pilot assessment site after finding it had an average to high incidence rate for our targeted conditions compared to other provinces, an adequate number of general care providers to power the assessment, and, to our knowledge, it had not been selected in previous non-communicable disease (NCD) assessments. An estimated 55% of total deaths in the Lao PDR are reported to be from non-communicable diseases, like diabetes and hypertension (WHO 2017). We designed three CPV vignette cases for each of these conditions. We assessed physicians (bachelor's degree or higher) in six facilities (four district and two provincial hospitals) throughout Luang Prabang province. The clinical assessment was accompanied by brief interviews with hospital administrators (deputy chief ministers of the health office or hospital) at each facility. This report presents the findings and recommendations from our Mission 2 assessment.

⁷ Participants of the second mission were Czarlota Valdenor, QURE; Mary Tran, QURE; and Pasoumphone Thammarongsad, Lao PDR Ministry of Health.

2. QUALITY CONCEPTS

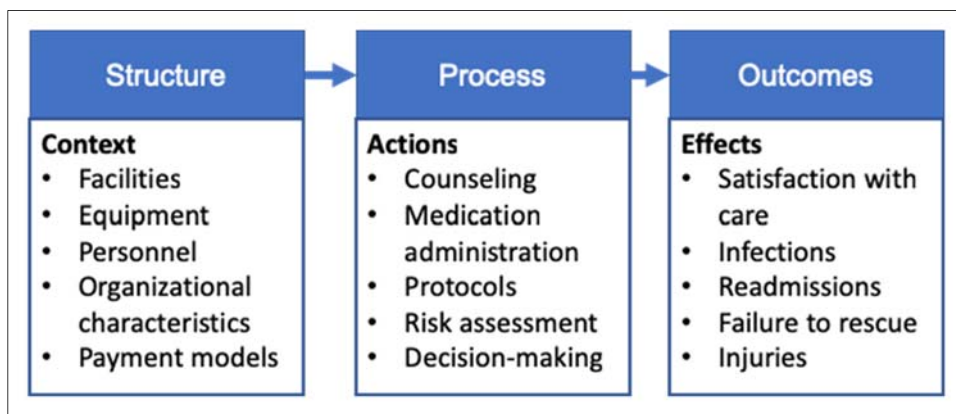
Structural measures of quality look at the resources, capacities, and systems needed to provide high-quality care (e.g., available equipment, drugs, ratio of providers to patients, insurance status), where process measures are what a provider does to maintain or improve health (e.g., ordering the correct test, making the diagnosis, and percentage of patients receiving preventive services).

Figure 1: Structure, Process, Outcome Metrics



Source: Donabedian et al. 1982.

Figure 2: Example Structure, Process, Outcome Metrics



Source: Donabedian et al. 1982.

Making the right diagnosis and providing the correct treatment is the most proximal determinant of outcomes. The current literature has shown that improving these processes of care should be an early focus of national quality improvement. In the Lao PDR, we believe systems should be in place to both continually educate physicians on better care practices and to quantify and track their progress to ensure continued change. Structured and frequent measurement and feedback using CPV vignettes can be a practical solution to help efficiently engage and educate the Lao PDR clinical providers on current evidence-based practices, as we demonstrated in this mission. Together with health officials, we traveled to six facilities, delivered vignettes to provider participants, and engaged providers and administrators in quality of care discussions.

The feedback from the providers who participated in this pilot assessment was enthusiastic, with genuine interest in the cases they reviewed and the evidence-based care standards we referenced. The strength of this approach is that it engages providers in a way that has never been accomplished by older methods of training

3. METHODS

Settings. We traveled to the northern province of Luang Prabang, which has an estimated population of approximately 460,000 people that is served by 94 health facilities. Those facilities consist of 1 provincial hospital, 12 district hospitals, 1 army hospital, and 90 health centers. To achieve a representative sample of clinical practice with an estimated standard deviation of 12% and a margin of error of less than 4%, we needed a minimum of 35 providers per case. These 35 providers were distributed in six facility sites selected by Ministry officials.

In this study, we went to the main provincial hospital, Luang Prabang Provincial Hospital, including its new pediatric facility, Lao Friend Hospital, and to four nearby district hospitals: (1) Nambak, (2) Ngoy, (3) Nan, and (4) Xieng Ngeun District. The provincial and district hospitals were purposively and collectively selected by us and the Luang Prabang Ministry of Health after reviewing disease incidence, number of providers, and patient referrals. We sought to gain a better understanding of care delivery, resource barriers, and the range of care within and between facilities. Future researchers will want to evaluate care provided at the health center level.

Study Objectives and Approach. We measured the quality of the process of care—what physicians do when they see their patients—in the Lao PDR. The goal was to demonstrate feasibility of process measurement using the CPVs of the doctors, to identify the gaps in their care for these three conditions, and to inform future interventions on the best way to elevate provider care and improve patient outcomes nationwide.

Study Participants. All providers practiced at the facilities and provided care for primary care patients on a regular basis. Physicians in the Lao Friend Hospital only cared for a pediatric population, while the other physician participants cared for both an adult and a pediatric population.

Clinical Conditions. We looked at the care for three of the more common conditions in the population: hypertension, diabetes mellitus, and pediatric diarrhea.

3.1 Data

Five sources of data were used in this study: (1) Lao PDR's District Health Information System 2 (DHIS2), (2) qualitative interviews with hospital and district administrators, (3) provider surveys on the quality of care, (4) facility survey on available resources, and (5) CPV vignettes for hypertension, diabetes mellitus, and children's diarrhea.

DHIS2. We reviewed available data on facility resources (e.g., equipment and drugs), number and type of providers, and disease incidence to identify and better understand facilities for inclusion in this assessment.

Qualitative Interviews with Hospital and District Administrators. We conducted brief qualitative interviews and focused these discussions around three main questions: (1) How effective was 10 MR and how do you think 5G1S will further improve quality?; (2) What are the top barriers to improving quality of care at your facility?; and (3) What would help you most to improve quality of care in your organization?

Provider Surveys. We distributed provider surveys prior to administering the CPVs. Providers were asked to give their definition of high-quality care and what they saw to be the top barriers and solutions for delivering high-quality care.

Facility Surveys. We identified selected essential services from WHO guidance on the care of these case types. Administrators were asked to indicate whether their facility had the listed resource or not.

CPV Vignettes. As demonstrated in NIH-funded studies, CPV vignettes are case–mix adjusted, making it uniquely possible to generate unbiased, benchmarked comparisons among individuals and groups of providers (Peabody et al. 2017). In this study, we designed one CPV vignette for each case type: hypertension, diabetes, and pediatric diarrhea (see Table 1). Scoring criteria were developed for each case to review the physician’s recommendations compared to evidence-based practices and protocols, specifically the WHO PEN (Package of Essential Noncommunicable disease interventions).

Table 1: CPV Patient Cases

Case Type	Patient Presentation and Key Assessment Points
Diabetes	Mr. Bouthavanh, 52 years old, presents with unexpected weight loss 1. Recognize and institute cost-effective workup of newly diagnosed diabetes and its complications 2. Emphasize medical nutrition therapy as first-line treatment for newly diagnosed diabetes 3. Prescribe appropriate pharmacologic treatment for diabetes (metformin as first line) 4. Estimate and manage overall cardiovascular risk 5. Emphasize primary preventive care for patients with diabetes, including screening, vaccination, and counseling
Chronic Obstructive Pulmonary Disease	Mr. Kommandam, 66 years old, presents with shortness of breath 1. Recognize and initiate management of acute decompensated heart failure, including hospitalization 2. Institute appropriate pharmacologic treatment for uncontrolled hypertension 3. Recognize that the patient has co-existing subclinical hypothyroidism 4. Estimate and manage overall cardiovascular risk 5. Emphasize primary preventive care for patients with COPD, including screening, vaccination, and counseling
Pediatric Diarrhea	Keophothong, 5 years old, is brought in by his mother looking weak 1. Recognize severe dehydration in a child with diarrhea 2. Utilize cost-effective diagnostic tests to evaluate severity and etiology of diarrhea 3. Administer appropriate non-pharmacologic and pharmacologic treatment for diarrhea with dehydration 4. Prescribe antibiotic therapy for a patient with acute gastroenteritis when necessary 5. Identify preventive strategies for diarrhea, including those on sanitation, hygiene, and safe food practices

Source: Author.

All of the providers in each of the six facilities were asked to complete all three CPV cases, except at the provincial hospital, where adult and pediatric care was separated between Luang Provincial Hospital and Lao Friend Hospital, respectively. Luang Prabang providers cared for the adult hypertension and diabetes cases and Lao Friend for the pediatric diarrhea case.

4. RESULTS

4.1 Qualitative Administrator Interview Findings

We completed 15 interviews with district or hospital administrators across all six facilities. See appendix for interview names. Our key findings from these interviews are these:

1. *The clinical knowledge of providers needs to be improved.* Administrative and clinical stakeholders believe that improving the knowledge and skill sets of providers is of primary importance to improving the quality of health care in the Lao PDR. Of note, in discussions they ranked this as a higher priority than obtaining health care equipment and resources. Paraphrasing one administrator, “What good is having equipment if our doctors don’t know how to use it?”
2. *The awareness of and use of clinical guidelines is inadequate.* Administrative and clinical stakeholders reported that few providers referred to the WHO PEN and Lao PDR PEN guidance for non-communicable disease care. Also of note is that none of the interviewees referenced the WHO-ISH CV risk factor charts for care of hypertension or diabetes patients in Southeast Asia.
3. *District and provincial hospitals offer some continuing medical education.* Provincial and district hospital administrators report rotating providers quarterly or semi-annually through courses funded by the provincial budget. They felt that the selection of participants and training topics was ad hoc.
4. *Electronic medical records (EMR) are being piloted.* Nan District Hospital was selected by the provincial health office to first pilot a new EMR last year. It currently has 8,000 records. With the EMR, systems are in place to track physician activity, recommendations, and patients that could improve provider accountability and productivity.
5. *“Train the trainer” model at Lao Friends is a potential case study for training approaches.* An initiative driven and funded by Friends Without Borders, volunteer pediatricians from abroad stay for months to years training physicians to eventually take over the full care of those at Lao Friends hospital. This is a multi-year plan to work directly with clinicians and train them on evidence-based care.
6. Providers expressed strong enthusiasm, in our discussions with them and in their discussions with their administrators, for receiving additional training and support.

4.2 Quantitative Provider Survey Results

Below are provider responses to the question, “How do you define quality health care?” and “What are the top barriers to providing high-quality care?” The prioritization for each factor listed in the table is based upon the number of respondents who listed it.

Table 2: Quality of Care Definitions

How Do You Define Quality Health Care?	Percentage of Respondents (n = 57)
Evidence based/effective treatment	19%
Good health/no illness	19%
Preventive and primary care	18%
Better outcomes	16%
Patient centered	11%
Accessible/comprehensive	11%
Good reception	9%
Good medical history	9%
Right diagnosis	9%
Good hygiene and sanitation	5%
Modern equipment/technology	4%
5G1S	4%
Quick recovery	4%
Specialty referrals	2%
Sufficient staff	2%
Ethical	2%

Note: Percentage totals add up to more than 100% because multiple definitions were allowed.

Source: Author.

Table 3: Top Barriers to High Quality of Care

What are the Top Barriers for You to Provide High-quality Care?	Percentage of Respondents (n = 57)
Lack of provider education	46%
Having necessary equipment	42%
Low patient cooperation	19%
Low patient education	14%
Access to medicines	12%
Lack of guidelines	11%
Language barriers	11%
Patient ethnic beliefs	7%
Staffing shortage	7%
Too many patients to see	5%
Access to remote areas	4%
Prevention	4%
Lab skills	4%
Self-preservation	2%

Note: Percentage totals add up to more than 100% because multiple definitions were allowed.

Source: Author.

4.3 CPV Vignette Results

Baseline Characteristics. Participants were 57 clinical providers from the Luang Prabang Provincial Hospital (both adult and pediatric facilities) and four surrounding district hospitals (see Table 3). A large majority identified themselves as general practice physicians (77%). The average age of participants was 38.1+11.4 years, and 61% of providers were female. All providers completed three CPVs except as noted above, in the provincial hospital.

Table 4: Baseline Provider Characteristics

N	57
Female	35 (61%)
Age	38.1+11.4
<i>Provider Type</i>	
Advanced nurse	1 (2%)
General practice physician	44 (77%)
Specialty physician	4 (7%)
Did not state	7 (12%)
<i>Facility</i>	
Lao-Friend Hospital (Pediatrics)	10 (18%)
Luang Prabang Provincial Hospital	20 (35%)
Nan District Hospital	7 (12%)
Nambak District Hospital	8 (14%)
Ngoy District Hospital	5 (9%)
Xieng Ngeun District Hospital	7 (12%)

Overall CPV Scores. The 57 providers took a total of 132 CPV cases across three different case types: adult diabetes mellitus, hypertension, and pediatric diarrhea. We observed high variability in the care provided, with the overall score for the group averaging 44.0%±11.8%, out of a possible 100% score (Figure 1). This score falls just slightly below the interquartile range of scores attained in an aggregate of previous QURE low-middle income country (LMIC) CPV studies (45%–65%) (Peabody et al. 2011).

CPVs have five clinical domains: history taking, conducting the physical examination, ordering laboratory and imaging workup, making the diagnosis, and recommending treatment. By domain, the highest scores attained by the providers were in the history and physical exam domains, with an average score of 56.7%±16.3% and 66.5%±33.2%, respectively (Table 4). The lowest-scoring domain was in treatment, with a domain average score of 29.5%±18.1%. The lower scores seen in treatment relative to other domains are typical of other QURE projects conducted, both in LMICs and high-income countries. The treatment domain is dependent on correctly performing in the antecedent care domain (i.e., history, physical, workup, and diagnosis), and it requires the most clinical judgment. Workup scores had the second lowest domain average (42.6%±22.0%). Workup performance was driven by the low selection of required tests that were needed to identify the correct diagnosis and the selection of unnecessary tests that add little value in making the correct diagnosis or treatment plan. Interestingly, the typical provider in this study averaged 0.5±0.7 unnecessary tests ordered per case. Two of the more common unnecessary tests ordered for

these cases were 2D echocardiograms (ordered unnecessarily in 8% of cases) and abdominal ultrasounds (ordered unnecessarily in 6% of cases). These are both expensive tests. Appropriate selection and use of diagnostic tests could thus represent not only improved clinical quality outcomes but also a significant economic cost savings opportunity. Diagnostic accuracy (primary and secondary diagnosis, etiology/severity) averaged only 47.7% across all cases, with primary diagnosis accuracy ranging from 61.7% (decompensated heart failure in the hypertension case) to 91.7% (new-onset diabetes) to 100% (dehydration). Diagnostic accuracy is worthy of a special note given that it is the determinant of delivering the appropriate and most cost-effective care.

Figure 3: Histogram of Overall CPV Scores

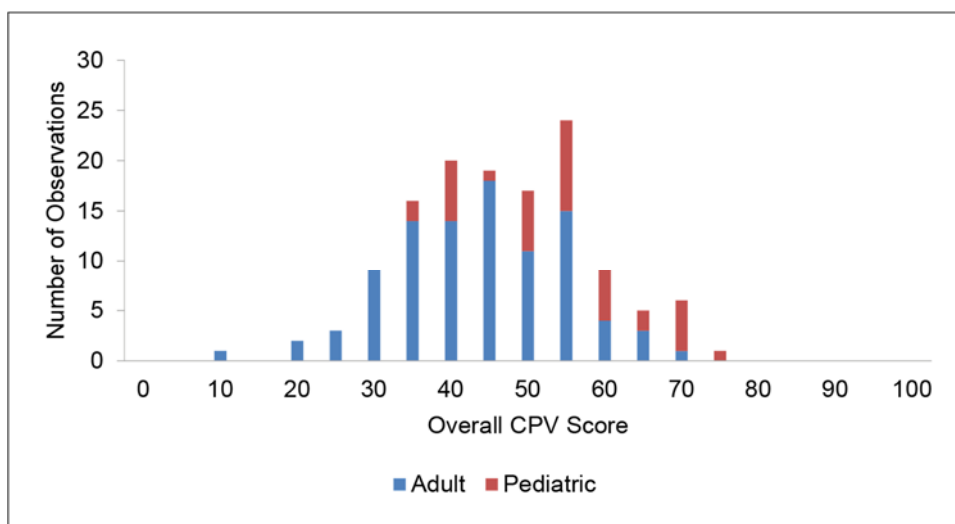


Table 5: Group Average Scores, Overall and by Care Domain

	Mean	S.D.
Overall	44.0	11.8
History	56.7	16.3
Physical	66.5	33.2
Workup	42.6	22.0
Diagnosis	47.7	23.3
Treatment	29.5	18.1
Low-value tests, #	0.5	0.7

Source: Authors.

Case Types. By case type, we found that the adult cases (diabetes and hypertension) averaged 41.1%, with the hypertension case averaging a clinically significant 3.7% higher quality score. Average facility scores ranged from 36.5% to 44.9% for these two cases, which was statistically significant ($p = 0.047$) (Table 6). Meanwhile, the pediatric diarrhea case averaged 51.4% among all facilities, with average facility scores ranging from 43.6% to 62.6%, which was both clinically and statistically significant (12.2% higher, $p < 0.001$).

Table 6: Facility Average Scores by Case Type

Facility	Diarrhea		Diabetes		Hypertension	
	N	Overall	N	Overall	N	Overall
Lao Friend Hospital	10	49.7	–	–	–	–
Luang Prabang Provincial Hospital	–	–	21	39.9	20	46.0
Nambak District Hospital	8	43.6	8	40.3	8	39.0
Nan District Hospital	7	52.0	7	34.1	7	38.9
Ngoy District Hospital	5	62.6	5	42.4	5	47.4
Xieng Ngeun District Hospital	7	54.2	7	39.1	7	39.5
Total	37	51.4	48	39.2	47	42.9

Source: Authors.

Drilling down into the diarrhea case, all providers who took the case were able to identify the primary diagnosis (acute gastroenteritis), but only one provider out of 37 who took the case was able to identify the specific etiology of the disease (*Vibrio cholerae*). In 2008, WHO reported 196 cholera cases in the Lao PDR.⁸ This low diagnostic performance may be due in part to the low levels of diagnostic workup performed for this case, wherein providers on average only ordered 24.7% (S.D. 14.1%) of the necessary tests, which included stool analysis for ova and parasites and stool culture. The absence of a specific etiologic diagnosis drove the low level of antibiotics prescribed for this case (5%), wherein only two providers ordered any antibiotics at all. More positively, 86% of providers ordered oral rehydration solution for the patient, but only 43% of providers recognized the moderate to severe dehydration and started the patient initially on IV hydration. Once the patient was stabilized and able to be discharged home, 62% of providers offered appropriate preventive care services in the form of counseling on good feeding practice, proper hygiene, food handling, etc.

In the diabetes case, the patient presented as a “classic” new diabetic with weight loss, polyuria, and polydipsia. Providers did particularly well in ordering appropriate diabetic workup, with 44 of 48 providers ordering either a fasting or random blood sugar test for this patient and nine providers ordering an HbA1c test. Perhaps not coincidentally, 44 of 48 providers also got the correct primary diagnosis of new-onset type 2 diabetes mellitus. However, 62% of providers unnecessarily admitted this patient to the hospital, when medical therapy and discharge home with a follow-up would have been sufficient. In fact, only 50% of providers placed this patient on metformin, which is recommended as first-line drug therapy by WHO PEN and DM guidelines, while 35% ordered a statin, 10% ordered an ACE inhibitor, and 5% ordered aspirin for this patient.

Finally, for the hypertension case, while most providers seemed to recognize the possibility of heart failure, with 68% ordering an electrocardiogram, 53% ordering a chest x-ray, and 64% ordering a lipid profile. Only 21%, however, ordered a diagnostic 2D echocardiogram for this patient, and only 31.9% (15 out of 47) performed a neuro exam. Despite the high marks on the workup, only 62% of providers made the primary diagnosis of decompensated heart failure. And while 88% (41 of 47) of providers correctly admitted the patient to the hospital, only 20 providers admitted the patient to the ward versus 21 unnecessarily admitting to the ICU (a much higher and more expensive level of care than is needed for this patient). Medically, while 74% ordered a diuretic, only 40% of providers correctly started an ACE inhibitor, and only 15% ordered a statin and even fewer (2%) ordered aspirin or a beta blocker for this patient.

⁸ WHO Cholera Country Profile: <http://www.who.int/cholera/countries/LaosCountryProfile2008.pdf>.

Structural Issues. The lower process quality of care was accompanied by structural shortages of equipment needed to perform necessary workup and treatment (Table 7). In this limited sample, the linkage between process and structure is difficult to tease out due to the low number of providers taking each case and the low utilization of some necessary diagnostic screens and treatments (for example, only 25% ordered an ACE inhibitor for the diabetes and hypertension cases despite all facilities having access to the medication). Interestingly, sulfonylurea was recommended more in the CPVs as treatment for the DM case even though it is less available than metformin in the facilities we surveyed: 31.3% (15 of 48) ordered a sulfonylurea for the DM case and only two facilities were identified as having sulfonylurea available (Lao Friend and Luang Prabang). Only one provider of 21 (4.8%) from those facilities ordered Daonil (glyburide), whereas those identified as not having sulfonylurea ordered at a much higher rate (51.9%, 14 of 27) ($p < 0.001$).

Table 7: Reported Resources Available by Facility

	Facility					
	Lao Friend Hospital	Luang Prabang Provincial Hospital	Nambak District Hospital	Nan District Hospital	Ngoy District Hospital	Xieng Ngeung District Hospital
Medications						
Aspirin	Y	Y	Y	Y	N	N
ACE inhibitor	Y	Y	Y	Y	Y	Y
Beta blocker	Y	Y	Y	N	N	Y
Calcium channel blocker	Y	Y	Y	Y	Y	N
Statin	Y	Y	N	Y	N	Y
Thiazide diuretic	Y	Y	Y	Y	Y	Y
Metformin	Y	Y	Y	N	Y	N
Sulfonylurea	Y	Y	N	N	N	N
Insulin	Y	Y	N	Y	N	N
Equipment						
Adult weighing scale	Y	Y	Y	Y	Y	Y
Measurement tape	Y	Y	Y	Y	Y	Y
Height board	Y	Y	Y	Y	Y	Y
Stethoscope	Y	Y	Y	Y	Y	Y
Blood pressure measurement	Y	Y	Y	Y	Y	Y
Glucometer	Y	Y	Y	Y	Y	Y
ECG	Y	Y	Y	N	N	N
Tests						
Blood glucose strips	Y	Y	Y	Y	Y	Y
Urine protein dipstick	Y	Y	Y	Y	Y	Y
Urine ketone dipstick	Y	Y	N	N	N	N
Lab glucose test	Y	Y	Y	Y	Y	Y
Cholesterol test	Y	Y	Y	Y	N	Y
Creatinine	Y	Y	Y	Y	N	Y
HBa1c test	Y	Y	N	Y	N	N
75g oral glucose load	Y	Y	Y	N	N	Y
Urine microalbuminuria	Y	Y	Y	Y	N	Y

Source: Author.

We found other results that are suggestive of structural issues that might be linked to process care shortcomings. In diagnostic workup, in cases where a lipid test was

required, we saw that those providers with access to the test were twice as likely to order the test than those who did not (61.2% vs 30.0%, $p = 0.089$). For ordering of 12-L ECGs, providers with access ordered the necessary test at a much higher level (89.3% vs 36.8%, $p < 0.001$). In the treatment domain, the results are a little less clear. Statin orders for facilities with access were nearly three times higher than for facilities without, although this did not achieve statistical significance (30.4% vs. 11.5%, $p = 0.068$). Similarly, metformin orders varied widely by whether or not the facility stocked the drug (67.7% vs 7.1%, $p < 0.001$). In other cases, the rate of ordering was so low in the medication-stocked facilities that obtaining a significant signal was not possible (aspirin orders: 4.2% vs 0.0%, $p = 0.569$; beta blocker orders: 2.9% vs 0.0%, $p = 1.000$).

5. DISCUSSION AND RECOMMENDATIONS

Improving the standard of clinical (process) care among clinicians is a priority for improving the health of the Lao PDR population. To do so, a critical step is to regularly measure and track current care processes. While there are now national indicators in the Lao PDR, the majority to date have focused on structural elements of care, such as staffing levels and infrastructure. While structural elements of care still need to be strengthened in the Lao PDR, numerous studies have shown that structural measures alone are weakly linked to better outcomes (Radmakers et al. 2011). Generally, the relationship between structural and process outcomes is considered to be weak and inconsistent. One of the most definitive studies summarizes this well using data from a high-income country (Brook et al. 2000). Experts agree that developing public information on the quality of care solely on structural measures is unwise (Kevin et al. 2009). That is not the case for process measures, which are linked experimentally to better outcomes (Peabody et al. 2018). Notwithstanding, it is hard to carry out a necessary care process when there are no drugs or equipment. As an example, availability of a diagnostic test (structural element) is proximate to securing a test result making the right diagnosis, the right explanations to the patient, and the delivery of effective direct observed treatment. These structural and process elements should all be present to yield the highest possible chance for a successful cure (outcome).

Measuring current clinical practice and identifying these right process metrics, however, can be very difficult given the resources available to do so. Patient charts offer difficult peer-to-peer comparisons given the variation in patient presentations and are unavailable/difficult to access across most of the Lao PDR. Surveying providers directly often delivers responses that differ vastly from what they actually do, a situation known as the know–do gap. CPVs were built to overcome these issues. The CPV is the only validated measure of a clinician's ability to evaluate, diagnose, and treat specific diseases and conditions (Dresselhaus et al. 2000), and CPVs have been used to inform quality improvement initiatives in over 22 countries.

Some may argue that improvement efforts should be focused on pre-service training of new physicians instead of those currently practicing. Relying on this approach results in an unacceptable delay in waiting for graduates to emerge and join the clinical workforce. While this is strong language, there is an urgency for patients today, who cannot wait for better care to emerge over time. Pre-service and in-service training need to be strengthened in parallel.

This mission demonstrated that CPVs are a feasible way to measure the quality of care in the Lao PDR. The CPV data we collected showed important gaps across a breadth of clinical issues, from pediatric care (diarrhea) to adult acute and chronic conditions (heart failure and COPD). Perhaps the most compelling finding from this modest investigation

is that some providers deliver excellent care in the current clinical environment. Symmetrically, others do not, and this variability in care is a relatively easy target that, if addressed, could rapidly improve health at the population level. Variability in care is pervasive across all health care systems and certainly due to a host of factors, including different provider capabilities, different educational programs, the availability or training resources, and patient preferences. The most important driver, however, is that variability persists and poor care abounds because the variability is not measured and revealed to providers.

To do this will require serial measurement and feedback. In and of itself, serial measurement leads to improvement in care delivery and better health (Shimkhada et al. 2008). Serial measurement makes it possible to follow the impact of other quality improvement methods and can complement existing initiatives, such as Dok Champa accreditation and quality indicator tracking in 10MR. Continuing medical education initiatives highlighted in the survey data we collected, for example, could be focused, revised, and upgraded using CPV measurement—a practice that is already in place and been shown in other LMIC settings to be effective (Luck et al. 2014). It would also be interesting to see whether the introduction of EMRs, discussed in our findings and being introduced in a stepwise fashion, is associated with better care.

We observed that clinical practice tracking can be readily done with CPVs and that the lessons gleaned could obviate futile or frustrated large outlays of capital as seen in other settings.⁹ We also observed that the gaps in care are expensive. These ranged from unnecessary tests to excessive inpatient utilization. These economic observations suggest that the cost of a national measurement program could be offset by less costly, more efficient care.

Related to measurement, another approach, successfully used in other LMIC countries, is accreditation of the facilities and the facilities' providers.¹⁰ This typically involves both structure and process measures, something that is easy to envision in the Lao PDR. From these other examples, we know that the impact of accreditation is marginal but real. Successful accreditation programs are clearly contingent upon local factors. We suggest introducing accreditation of a few facilities at a time, using among other factors the CPVs to measure the impact on care to get this right in the Lao PDR. The observations above also suggest that train-the-trainer approaches, using outside clinical experts, could be effective, but the ability to recruit enough trainers on a national scale for the extended amounts of time required have to be weighed against the availability of trainers and the cost of a large-scale rollout.

In conclusion, we recommend implementing nationwide measurement and training modules to general physicians first in the area of adult NCDs, a growing problem, and pediatric diseases. Such a program would, in and of itself, improve care. Moreover, measurement identifies specific care gaps, highlights cost inefficiencies, and provides valuable feedback for other contemplated quality improvement policies.

⁹ Becker's Health Report. Electronic Health Records: The Good, the Bad and the Ugly. Accessed October 2018. <https://www.beckershospitalreview.com/healthcare-information-technology/electronic-health-records-the-good-the-bad-and-the-ugly.html>.

¹⁰ WHO. Quality and accreditation in health care services: A global review. Accessed October 2018. http://www.who.int/hrh/documents/en/quality_accreditation.pdf.

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APPENDIX

Administrative Interviews

7. Dr. Bui Rattana, Head of Nam Bak DHO
8. Dr. Simay Sisouphak, Deputy Head of Nam Bak DHO
9. Mr. Chanty Keomanyvong, Acting of Head of Ngoy DHO
10. Dr. Amphone Phraam Mixay, Head of Luang Prabang PHO
11. Dr. Bounthiem Siphada, Deputy Head of Luang Prabang PHO
12. Dr. Niphone Simphaly, Deputy Head of Luang Prabang PHO
13. Mr. Sengchanh Sayavong, Deputy Head of Luang Prabang PHO
14. Mr. Bounsavath, Head of Administrator PHO
15. Dr. Thongsavanh, Head of Health Care Division
16. Mr. Bounheuung, Deputy Head of Planning Division
17. Ms. Somveophone Doaungprasith, Head of Xieng Ngeun DHO
18. Ms. Veosomphone Douangpasith, Head of Xieng Ngeun DHO
19. Dr. Hongpan Savathpay, Head of Ngoy DHO
20. Mr. Simon Young, Lao Friend Hospital for Children
21. Dr. Thongphout Soukhaseum, Deputy Director of Luang Prabang Provincial Hospital